



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/NL98/00291</p> <p>(22) International Filing Date: 25 May 1998 (25.05.98)</p> <p>(30) Priority Data: 1006134 26 May 1997 (26.05.97) NL</p> <p>(71) Applicant (for all designated States except US): NIA TNO B.V. [NL/NL]; De Boelelaan 30, NL-1083 HJ Amsterdam (NL).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): DELLEMAN, Nicolaas, Johannes [NL/NL]; Berkenrodelaan 34, NL-1181 AJ Amstelveen (NL).</p> <p>(74) Agent: SMULDERS, Th., A., H., J.; Vereenigde Octrooibureaux, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. In English translation (filed in Dutch).</p>
<p>(54) Title: AUXILIARY APPARATUS FOR MANUALLY LOADING AND/OR UNLOADING LOOSE CARGO ITEMS</p> <div data-bbox="427 1163 1222 1650"> </div> <p>(57) Abstract</p> <p>An auxiliary apparatus for manually loading and/or unloading loose cargo items, which apparatus (1) comprises a feed and/or discharge track (2) and a table (3) which connects to one end of the feed and/or discharge track such that the cargo items to be loaded and/or unloaded can be slid from the feed and/or discharge track onto the table or vice versa. The auxiliary apparatus comprises lift means (4) by means of which the height of inter alia the table is adjustable. The dimension of the table viewed in the conveying direction is such that a loader can reach across the table. The dimension of the table viewed in a direction transverse to the conveying direction is considerably greater than the width of the feed and/or discharge track, so that the cargo items are displaceable in transverse direction over the table and slidable directly from the table onto a desired stack from a row of stacks to be formed.</p>		

Title: Auxiliary apparatus for manually loading and/or unloading loose cargo items.

The invention relates to an auxiliary apparatus for manually loading and/or unloading loose cargo items.

In particular in cargo spaces having a limited height and a great length, loading and unloading forms a problem.

- 5 Such cargo spaces can for instance be found in so-called narrow body airplanes, such as for instance a Boeing 737, where the cargo space has a maximum height of about 1.15 m and a length from the cargo hold door of about 1.5 to more than 7 m. The loading and/or unloading of such cargo spaces
- 10 must take place within a very short time and, in the hold, is performed entirely manually. The cargo items, such as for instance suitcases, must be stacked in the cargo hold. A first loader, moving in the cargo hold on his knees, begins by forming stacks against an end wall of the cargo hold and,
- 15 with the formation of stacks, thus gradually fills the cargo hold from that end wall up to the cargo hold door. A second loader slides the cargo items to be loaded from the cargo hold door in the direction of the first loader. The cargo items reach the first loader at his backside. Hence, for
- 20 placing a cargo item presented to him, the first loader must in kneeling working position turn his trunk about its length axis to be able to pick up the cargo item supplied. From this twisted position, the first loader must lift the cargo item for placing it onto a stack. Such movement forms a
- 25 particularly unfavorable burden to the back and other parts of the loader's body. Moreover, the pressure of time, which plays a particularly great part during loading and/or unloading, has as a consequence that the physical effort is greater, and that not all movements are carried out equally
- 30 carefully, so that injuries may readily occur. Because of the heavy burden to the loader, the loading and/or unloading operation can only be maintained for a short time. Moreover, the profession of loader can be performed only for a limited number of years.

From prior art publications, auxiliary apparatus for loading and/or unloading loose cargo items are known per se.

EP-A-0 615 925 describes an auxiliary apparatus for loading pallets, which auxiliary apparatus comprises a feed track and a table which is connectable to one end of the feed track such that the cargo items to be loaded can be slid from the feed track onto the table, the apparatus comprising lift means by means of which the height of the table is adjustable. Hence, with this apparatus, the loader can slide the cargo items from the table onto a stack to be formed without actually lifting the cargo items. This known auxiliary apparatus has as a particular feature that it is arranged on a rail so as to be mobile in transverse direction relative to the feeding direction of the feed track. When the cargo items should be placed slightly more leftwards or rightwards on a pallet, the entire auxiliary apparatus is displaced slightly more leftwards or rightwards. However, in practice, situations occur where a total displacement of the auxiliary apparatus transverse to the longitudinal direction of the feed track is not possible. Here, one may for instance think of cargo spaces which leave clear relatively little space for movement to the loader, such as for instance the cargo space of an airplane or truck. In such limited cargo space, displacement of the auxiliary apparatus in a transverse direction would cause the loader to get jammed between a sidewall of the cargo hold and the auxiliary apparatus.

US-A-5 325 953 also discloses an auxiliary apparatus comprising a feed track and a table which is connectable to one end of the feed track such that the cargo items to be loaded can be slid from the feed track onto the table. However, with this apparatus, the cargo items must be lifted from the table and carried to the eventual position by a loader. Hence, when loading with the use of this known auxiliary apparatus, the loader still undergoes a considerable burden.

The object of the invention is to provide an auxiliary apparatus for loading and/or unloading loose cargo items whereby the above drawbacks of the conventional manner of loading and unloading and of the known auxiliary apparatus are overcome. Preferably, the auxiliary apparatus contemplated does not form part of the cargo space, to prevent the waste of costly loading space.

To this end, the invention provides an auxiliary apparatus comprising a feed and/or discharge track over which the cargo items can be fed and/or discharged in a conveying direction, and a table which is connectable to one end of the feed and/or discharge track such that the cargo items to be loaded and/or unloaded can be slid from the feed and/or discharge track onto the table and vice versa, the auxiliary apparatus comprising lift means by means of which the height of the table and the end of the feed and/or discharge track is adjustable, the dimension of the table viewed in the conveying direction being such that a loader can reach across the table, the dimension of the table viewed in a direction transverse to the conveying direction being considerably greater than the width of the feed and/or discharge track, so that the cargo items are displaceable in transverse direction over the table and slidable directly from the table onto a desired stack from the row of stacks to be formed.

Via the feed and/or discharge track, the cargo items to be loaded are conveyed from the cargo hold door to a position adjacent an end wall of the cargo hold or adjacent the last-formed row of stacks in the cargo hold. Preferably, the dimension of the table viewed transversely to the conveying direction of the feed and/or discharge track substantially corresponds to the width of a row of stacks to be formed. In an airplane, this width will substantially correspond to the width of the cargo hold of the airplane. The table is located between the end wall or the last-formed row of stacks and the first loader. During loading, all that the first loader has to do is set the table at a desired first stack height by

means of the lift means and slide the cargo items, slid onto the table via the feed and/or discharge track, in transverse direction over the table and slide them from a desired position on the table onto a desired position on the row of stacks to be formed. In this manner, when the loading of the cargo space is started, the beginning of a row of stacks can be formed against an end wall. When all stacks to be formed against the end wall have reached the desired first stack height, the table can be set at a desired second stack height and the loader can raise the formed row of stacks to the second stack height. This process is repeated until all stacks from the row of stacks lying against the end wall have been formed up to the top end of the cargo hold. It is observed that the row of stacks does not consist of separate stacks. The cargo items do not have the same dimensions, so that one suitcase sometimes rests on, for instance, two or three subjacent suitcases and the row of stacks has the appearance of a disorderly built wall of bricks having different dimensions. Subsequently, the loader can move the table a little bit in the direction of the loading door for forming a second row of stacks in the same manner. This process is repeated until the first loader has reached the door of the cargo hold. The major advantage of filling the cargo hold in this manner is that the loader does not have to lift the items and does not have to turn his trunk about its length axis to be able to grasp the cargo items.

During the unloading of the cargo hold, the above operations regarding loading take place in a reverse order. The loader pulls the items directly from the stacks onto the table and slides them over the table in transverse direction to the feed and/or discharge track. Via this feed and/or discharge track, the items are removed from the cargo hold. Also for unloading the cargo hold, it applies that the loader does not have to lift the items when taking them from the stacks. The rotational movement of the upper body can be reduced to a minimum as well.

Not only is the physical burden to loaders considerably reduced, loading and/or unloading can moreover take place much faster.

In order that the second loader, who slides the items from the loading door to the first loader, can be used for other operations, according to a further elaboration of the invention, it is particularly favorable when the feed and/or discharge track comprises an endless conveyor by means of which the cargo items to be loaded or unloaded can be conveyed to and/or from the table. With an apparatus of such design, the cargo items are automatically conveyed to the first loader and slid onto the table without the intervention of a second loader.

Preferably, the feed and/or discharge track with the endless conveyor extends from the ground surface on which the airplane sits to the door of the cargo hold to be loaded, and from the loading door into the cargo space. The second loader can then outside the plane on the ground occupy himself with placing cargo items onto the endless conveyor or removing them therefrom. For this, the conventional manner of loading and unloading cargo items required a third loader under particular circumstances (depending on the type of airplane).

Further elaborations of the invention are described in the subclaims and will hereinafter be specified on the basis of a number of exemplary embodiments, with reference to the accompanying drawings.

Fig. 1 is a perspective view of a cargo space in which a loader is engaged in loading by means of an exemplary embodiment of the apparatus;

Fig. 2 is a top plan view of a portion of the exemplary embodiment shown in Fig. 1;

Fig. 3 is a side elevation of the exemplary embodiment shown in Figs. 1 and 2;

Fig. 4 is a sectional view taken on the line IV-IV in Figs. 2 and 3, in which the table is not yet folded out and

the supply and/or discharge track end is not yet swivelled — around;

Fig. 5 is a top plan view of the bend section of the exemplary embodiment shown in Figs. 1-4;

5 Fig. 6 is a sectional view taken on the line VI-VI in Fig. 5;

Fig. 7 is a side elevation of the end part of the exemplary embodiment;

10 Fig. 8 is a top plan view of the exemplary embodiment shown in Figs. 1-7 in different positions;

Fig. 9 is an end view of a first exemplary embodiment of a table of the apparatus in a first and a second position; and

15 Fig. 10 is an end view of a second exemplary embodiment of a table of the apparatus in a first and a second position.

Fig. 1 clearly shows how the loader B is positioned relative to the apparatus 1 for loading and unloading, in the cargo hold H of a vehicle, in this case an airplane. The apparatus 1 comprises a feed and/or discharge track 2 over  
20 which the cargo items can be fed and/or discharged in a conveying direction. The apparatus further comprises a table 3 connectable to an end 2a of the feed and/or discharge track 2 such that the cargo items K to be loaded and/or unloaded, such as suitcases or other types of packages, are slidable  
25 from the feed and/or discharge track 2a onto the table 3 or vice versa. The auxiliary apparatus comprises lift means 4 by means of which the height of the table 3 and the end of the feed and/or discharge track 2 is adjustable. The table 3 is located between the loader B and an end wall H1 of the cargo  
30 hold H. It is clearly visible that the dimensions of the table 3 viewed in the conveying direction of the feed and/or discharge track 2 are such that a loader B can reach across the table 3. The dimension of the table 3 viewed in a direction transverse to the conveying direction is  
35 considerably greater than the width of the feed and/or discharge track 2. Thus, the cargo items K are displaceable

in transverse direction over the table 3 and can directly be slid from the table 3 onto a desired stack S from the row of stacks to be formed.

The feed and/or discharge track 2 comprises at least one endless conveyor 5 by means of which the cargo items K are conveyed towards the table 3 during loading, or conveyed outside the cargo hold H during unloading. During loading of the cargo hold H, the loader B only has to pull the cargo items K, fed onto the table 3 by the conveyor 5, over the table surface and slide them onto the desired stack S. During unloading, the loader B can pull the cargo items K from the stacks S onto the table 3 and slide them over the table surface towards the conveyor 5 acting as discharge track 2.

As appears from Figs. 2, 3 and 4, the apparatus 1 is mobile on the ground G on which the airplane sits as well. The cargo hold H and the loading door D of the cargo hold H are clearly visible. The apparatus comprises a base part 6 accommodating the drive mechanism for the conveyor 5 and a number of return wheels 7 and at least one tensioning wheel 8 for guiding the conveyor 5. The base part 6 also comprises a lifting telescope 9 by means of which the feed and/or discharge track 2 can be moved from a storing position into an operative position, i.e. into a position in which the feed and/or discharge track 2 can be moved into the cargo hold H. The feed and/or discharge track 2 comprises a number of track parts 2a, 2b, 2c which can be telescoped in and out and/or folded in and out to provide a variable length to the feed and/or discharge track 2. When the track parts 2b, 2c, 2d are being telescoped out, the length of the conveying face created by the conveyor 5 should of course increase. This extra length is available in that the loop 11 that is moved through by the conveyor 5 in the base part 6 can be shortened by displacing the return wheels 7 in the direction of the tensioning wheel 8.

Moreover, the feed and/or discharge track 2 is provided with a swivel construction 10 by means of which the feed



and/or discharge track 2 can be swivelled about a substantially vertical axis 11, enabling the feed and/or discharge track 2 to follow a path having a bend C. Details of this swivel construction are clearly shown in Figs. 5 and 6. These Figures also clearly demonstrate that the track parts 2b, 2c, 2d each comprise a pair of wheels whereby the track parts 2b, 2c, 2d are supported and can be moved over the floor H2 of the cargo hold H. To enable the swivel movement, the conveyor 5 must have some play so that it can move through a bend. Such conveyors are known per se and commercially available.

Fig. 7 clearly shows that the table 3 is hooked in hooks 15 under the track parts 2b, 2c and 2d. Further, by means of a slidably bearing-mounted swivel pin 16, the table 3 is connected to the end of the feed and/or discharge track 2, as appears from Fig. 8. Before the end 2a, 2b, 2c, 2d of the feed and/or discharge track 2 is swivelled around, the table 3 is disengaged from the hooks 15, so that it will rest on the floor. Fig. 8 shows in what manner the swivel pin 16 slides along the table 3 when the table 3 is being folded out and the end of the feed and/or discharge track 2 is being swivelled around. For the purpose of this swivel action, it is necessary that the swivel wheels 12 supporting the track parts 2b, 2c, 2d be of collapsible construction, so that the table 3 can move from under these track parts 2b, 2c, 2d. When the end 2a, 2b, 2c, 2d has swivelled 90 degrees, the table 3 can be detached from the swivel pin 16. Subsequently, a track part 2a, which in the present exemplary embodiment serves for bridging the height difference between the table 3 and the feed and/or discharge track 2, can be folded out and pivotally connected to the table 3 by means of a connecting pin 17, so that the discharge track 2 connects to the table 3. The track part 2a is also provided with a conveyor 18 driven in synchronization with the conveyor 5.

As the cargo hold H of an airplane has a specific shape, it is desired that the table 3 can adopt different

widths. To this end, the table comprises side parts 14 connected to a central part 18 of the table 3 for pulling out (Fig. 9) or folding out (Fig. 10). As is clearly shown in Figs. 9 and 10, the table comprises lift means 4 constructed as a scissor lift 4. The scissor lift 4 may be electrically or pneumatically adjustable. The table further comprises wheels or track chains 13 by means of which the table 3 is mobile over the floor surface H2 of the cargo hold. In the exemplary embodiment of Fig. 9, the extent to which the side parts 14 can be pulled out may or may not be coupled to height adjustment of the lift means.

The use of the apparatus for loading and/or unloading is as follows:

The apparatus 1 is rolled in a folded-in condition to the airplane that is to be loaded or unloaded. Next, the door D of the cargo hold H is opened. By means of the lifting cylinder 9, the feed and/or discharge track 2 is lifted, enabling the end 2a, 2b, 2c, 2d of the feed and/or discharge track to be moved into the cargo hold H. This condition is shown in Figs. 2, 4, 5, 6 and 8. Next, the table 3 is disengaged from the hooks 15 and positioned on the floor H2 of the cargo hold H. After that, the track chains 13 are driven, causing the table 3 to move in the direction of the end wall H1. As a result of the pulling force exerted by the table 3 on the swivel pin 16, the end 2a, 2b, 2c of the feed and/or discharge track 2 will swivel about the axis 11 until it has swivelled through 90°. After this swivel movement, the table 3 is in such position that the main surface thereof, viewed from the top, extends at an angle of substantially 90° to the conveying direction of the end of the feed and/or discharge track 2. Subsequently, the table 3 can be uncoupled from the swivel pin 16 and moved slightly further in the direction of the end wall H1, enabling the end 2a of the feed and/or discharge track 2 to be folded out and connected to the table 3 by means of the connecting pin 17. During loading, the track parts 2a, 2b, 2c, 2d are subsequently

pulled out and/or folded out, as a result of which the feed and/or discharge track 2 assumes a length such that the end thereof is located adjacent the end wall H2 of the cargo hold H. This pulled-out condition is shown in Figs. 1, 2, 3 and 5 shown in dotted lines in Figs. 4 and 8. During loading, the hold is filled with cargo items from this pulled-out condition. During loading, the feed and/or discharge track 2 is pushed in each time when a complete row of stacks has been formed. This process is continued until the feed and/or 10 discharge track has assumed a completely pushed-in condition.

During the unloading of the hold H, one proceeds from this pushed-in condition gradually towards the pulled-out condition, while removing items K.

It is understood that the invention is not limited to 15 the exemplary embodiments described, but that various modifications are possible within the framework of the invention. The invention is presently described with reference to an exemplary embodiment intended for loading and unloading a cargo hold of an airplane. However, the apparatus 20 according to the invention is also highly suitable for unloading other cargo spaces, such as for instance the cargo space of trucks. As the cargo space of trucks is in line with the loading door, the swivel construction 10 by means of which the end of the feed and/or discharge conveyor 2 can be 25 swivelled over 90 degrees in two directions can be dispensed with.

An alternative to the swivel construction could for instance be formed by a telescopic feed and/or discharge conveying track assembly part which can be telescoped in and 30 out in a direction perpendicular to an upstream feed and/or discharge conveying track assembly part. The conveying direction of the cargo items can then be changed by means of a guide track, such as for instance a vertical wall part curved into a bend.

35 It is also well conceivable that the apparatus is used when there are no spatial limitations, such as for instance

during the loading and unloading of cargo items onto or from a pallet or a flat wagon. It is expected that the apparatus will be put into use when complete automation of the loading and/or unloading operations, i.e. without a person's manual involvement, is not feasible from a financial, technical and/or operational point of view, for instance because the surroundings are difficult or impossible to access for the conventional loading/unloading apparatus/machines such as a lift truck, or because the necessary intelligence during loading/unloading is difficult or impossible to incorporate into an apparatus/machine. The apparatus can also be deployed when packaging of cargo items into larger units is not desired for reasons of, for instance, space saving - a pallet for instance occupies cargo space - or environmental protection, for instance through limitation of packaging waste, extra fuel for transport, etc.

Essentially, the auxiliary apparatus is of such design that during loading/unloading, the loader no longer has to lift the cargo items, but only has to slide them, and can adopt a favorable working position while, moreover, the loading and/or unloading operation can proceed at high speed.

Claims

1. A auxiliary apparatus for manually loading and/or unloading loose cargo items, said apparatus (1) comprising a feed and/or discharge track (2) over which the cargo items can be fed and/or discharged in a conveying direction, and a  
5 table (3) which is connectable to one end (2a) of the feed and/or discharge track (2) such that the cargo items to be loaded and/or unloaded can be slid from the feed and/or discharge track (2) onto the table (3) or vice versa, the auxiliary apparatus comprising lift means (4) by means of  
10 which the height of the table (3) and the end of the feed and/or discharge track (2) is adjustable, the dimension of the table (3) viewed in the conveying direction being such that a loader (B) can reach across the table (3), the dimension of the table viewed in a direction transverse to  
15 the conveying direction being considerably greater than the width of the feed and/or discharge track (2), so that the cargo items (K) are displaceable in transverse direction over the table (3) and slidable directly from the table (3) onto a desired stack (S) from a row of stacks (S) to be formed.
- 20 2. An auxiliary apparatus according to claim 1, characterized in that the dimension of the table (3) viewed in a direction transverse to the conveying direction substantially corresponds to the width of the row of stacks (S) to be formed.
- 25 3. An auxiliary apparatus according to claim 1 or 2, characterized in that the feed and/or discharge track (2) comprises an endless conveyor (5) by means of which the cargo items (K) to be loaded or unloaded can be conveyed to and/or from the table (3).
- 30 4. An auxiliary apparatus according to any one of the preceding claims, characterized in that the feed and/or discharge track (2) comprises a number of track parts (2a, 2b, 2c, 2d) which can be telescoped in and out and/or folded

in and out to provide a variable length to the feed and/or discharge track (2).

5. An auxiliary apparatus according to claim 4, characterized in that the table (3) and the track parts (2a, 2b, 2c, 2d) comprise support means (13 and 12 respectively) by means of which the table (3) and the track parts (2a, 2b, 2c, 2d) are mobile or slidable over the floor (H2).

6. An auxiliary apparatus according to any one of the preceding claims, characterized in that the feed and/or discharge track (2) comprises a swivel construction (10) by means of which the feed and/or discharge track (2) can be swivelled around a substantially vertical axis (11), enabling the feed and/or discharge track (2) to follow a path having a bend (C).

7. An auxiliary apparatus according to any one of the preceding claims, characterized in that the table (3) comprises table side parts (14) which can be pulled out or folded out, by means of which the dimension of the table (3) is adjustable in transverse direction.

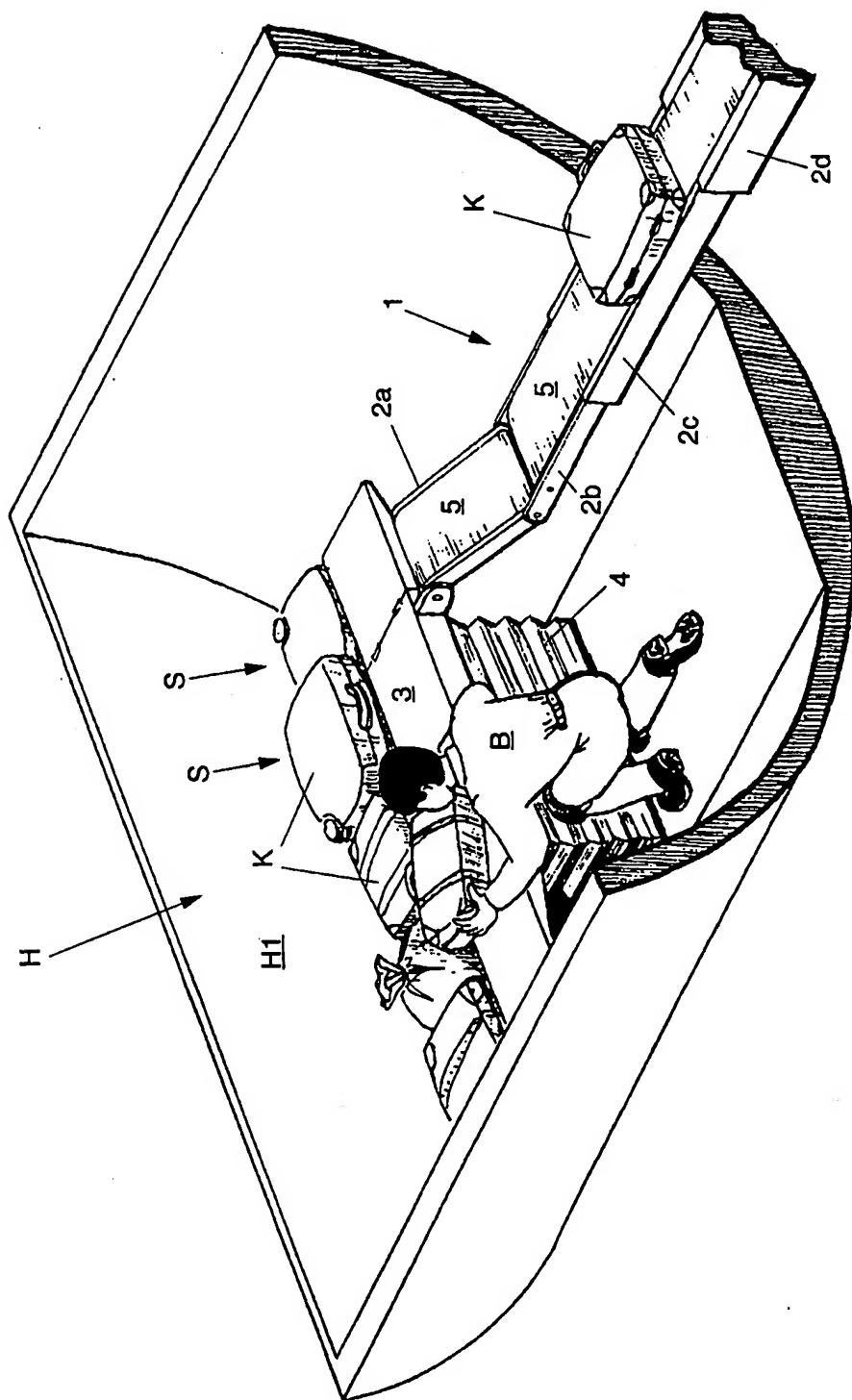


Fig. 1

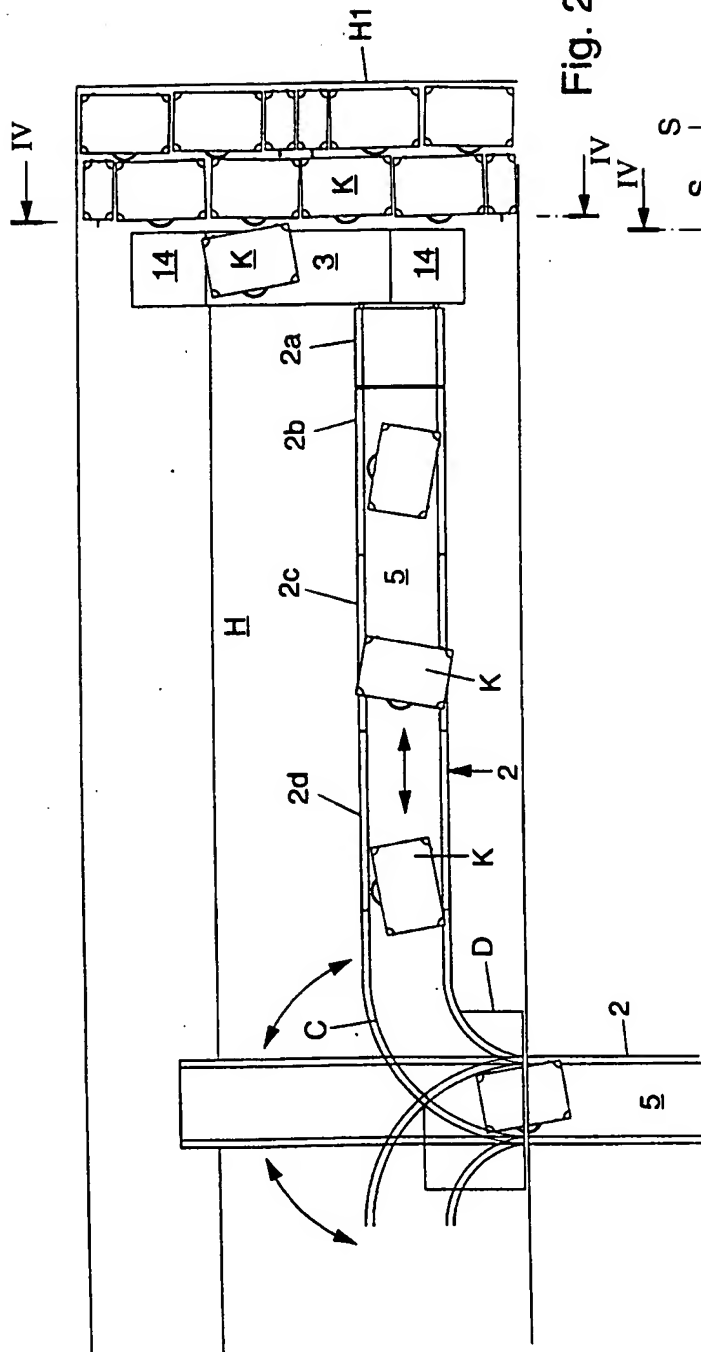


Fig. 2

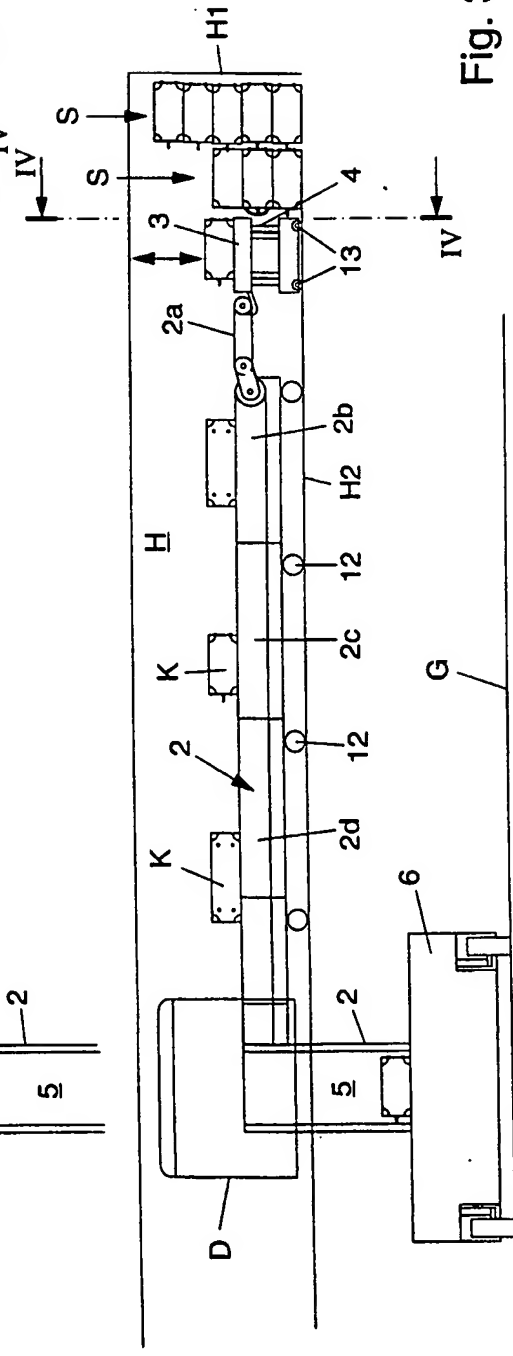


Fig. 3



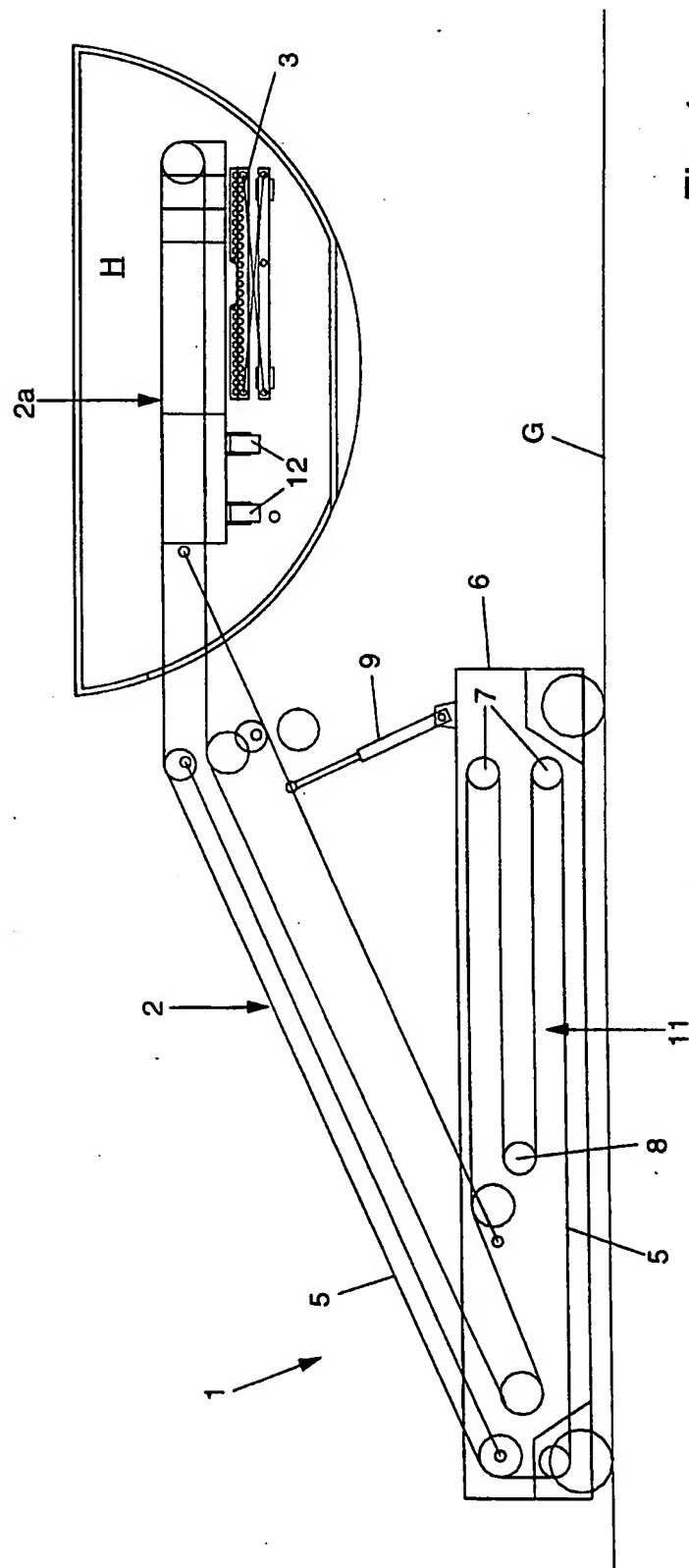


Fig. 4

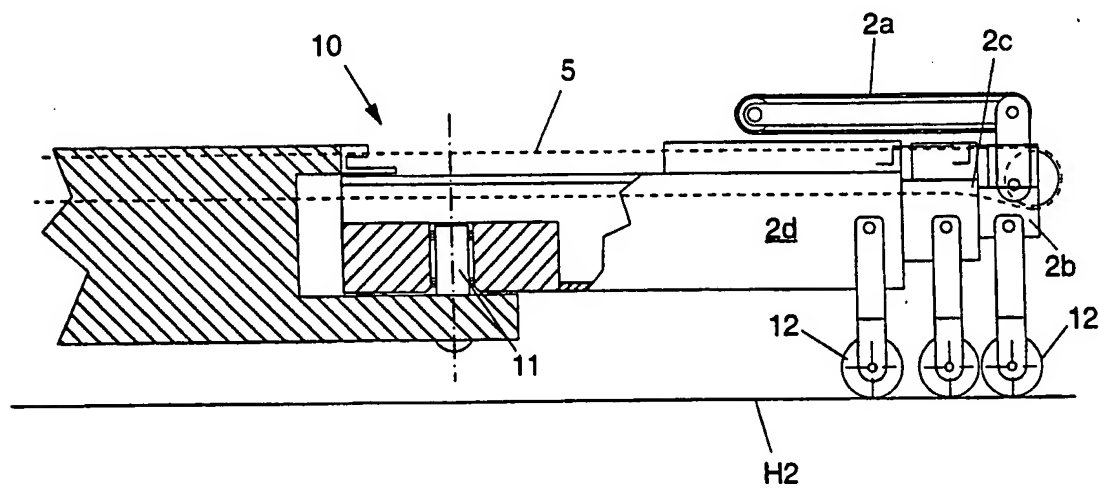
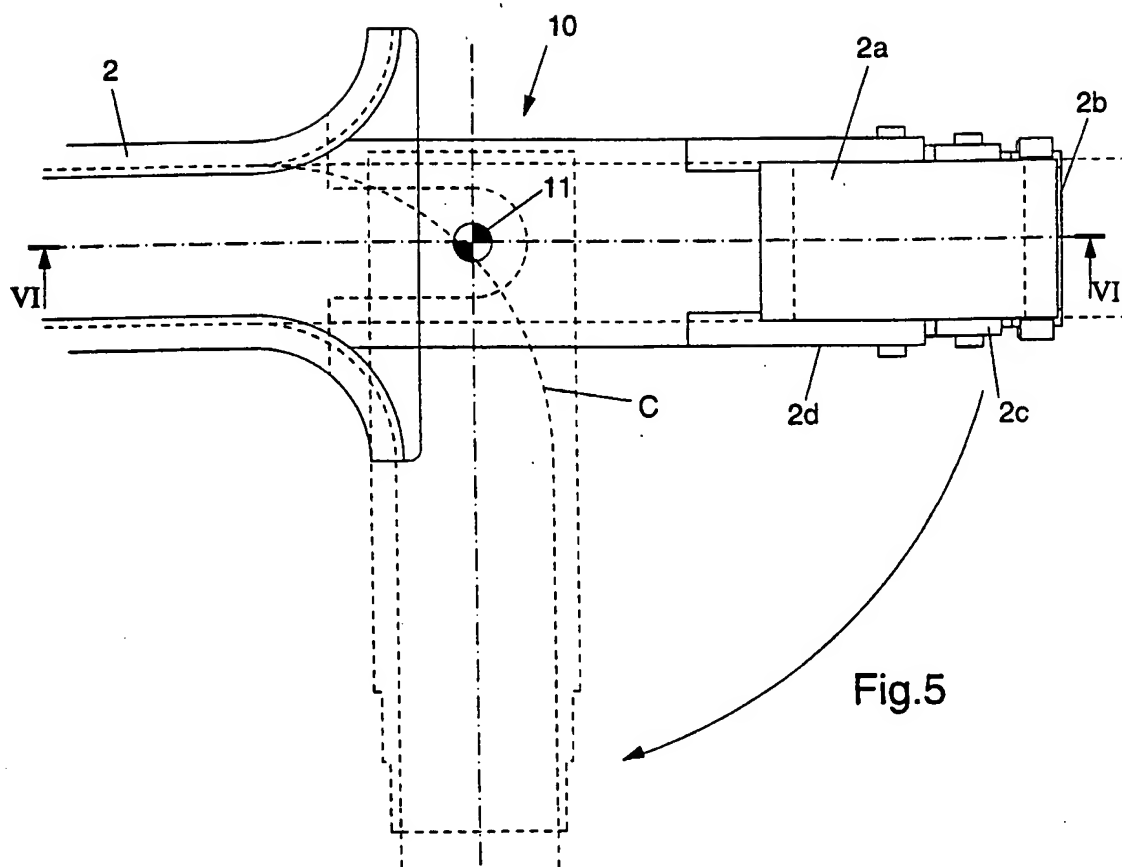


Fig.6

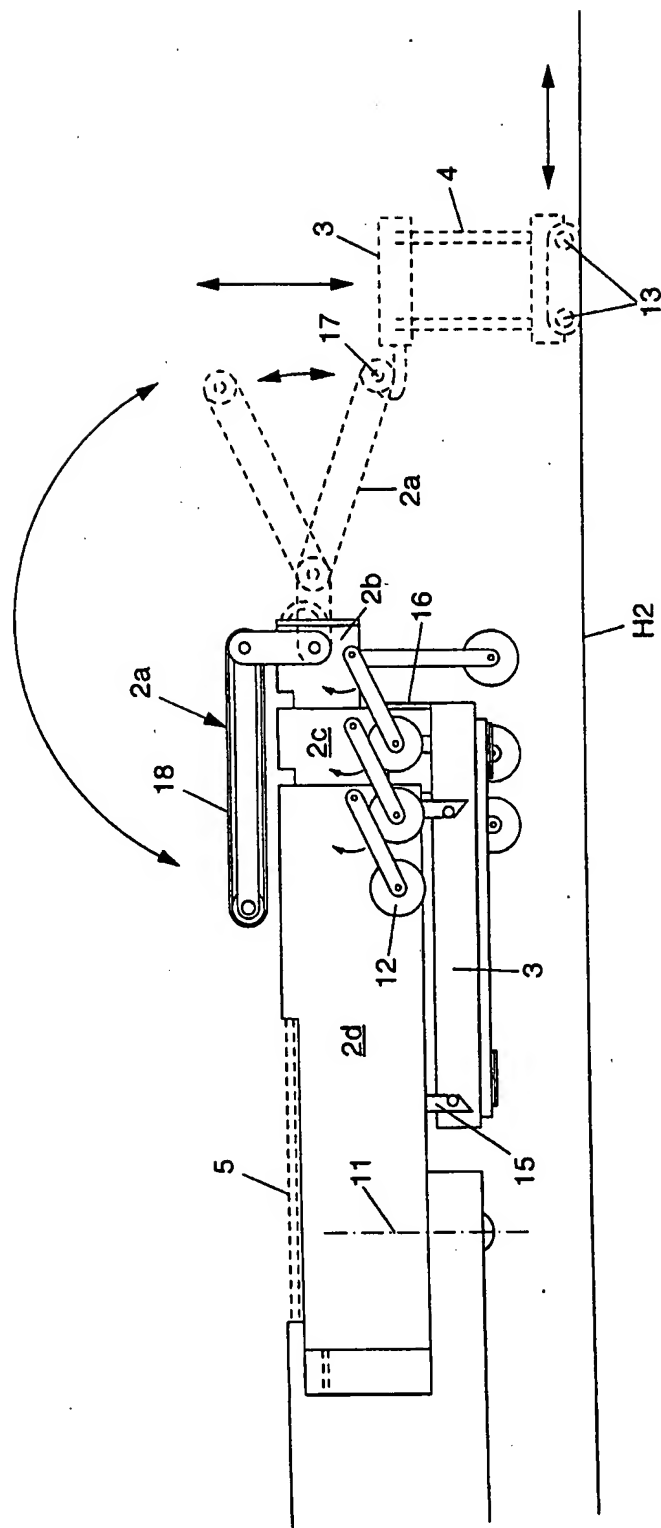


Fig. 7

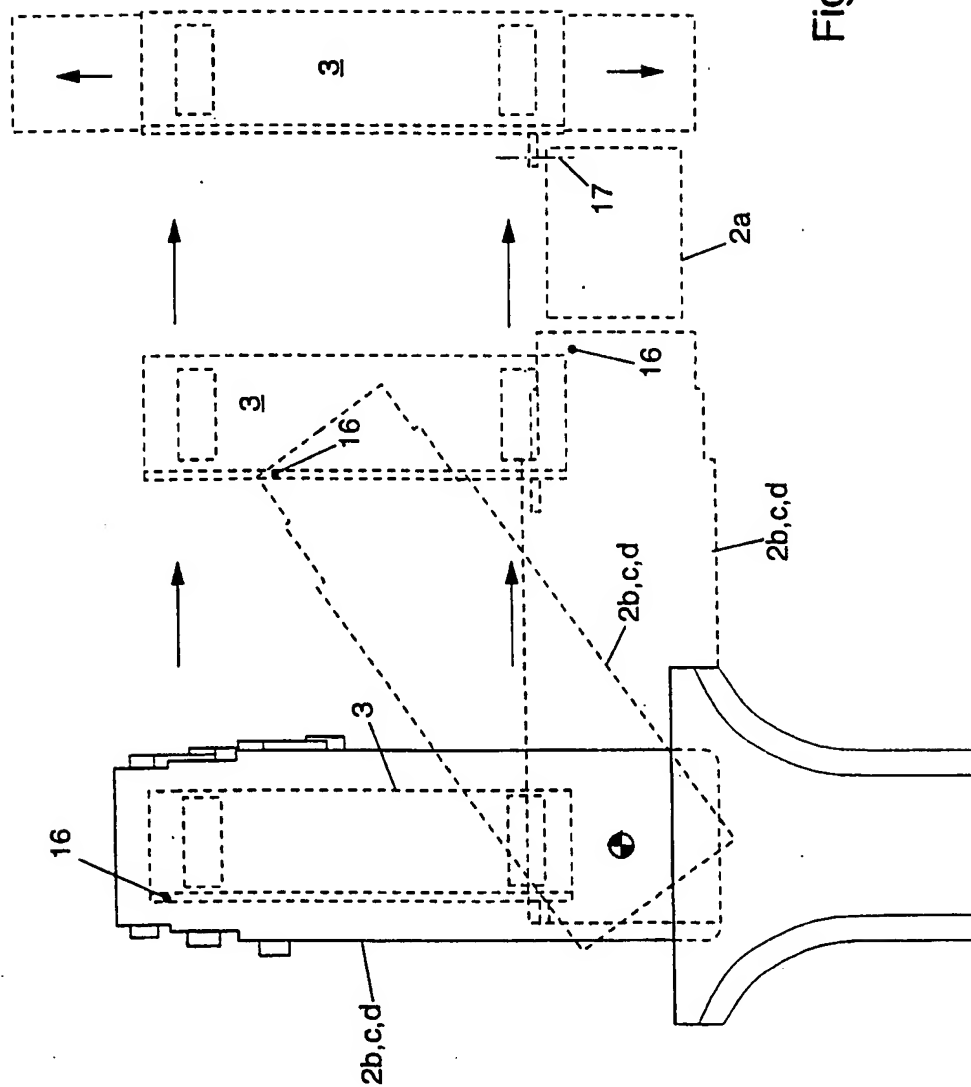


Fig. 8

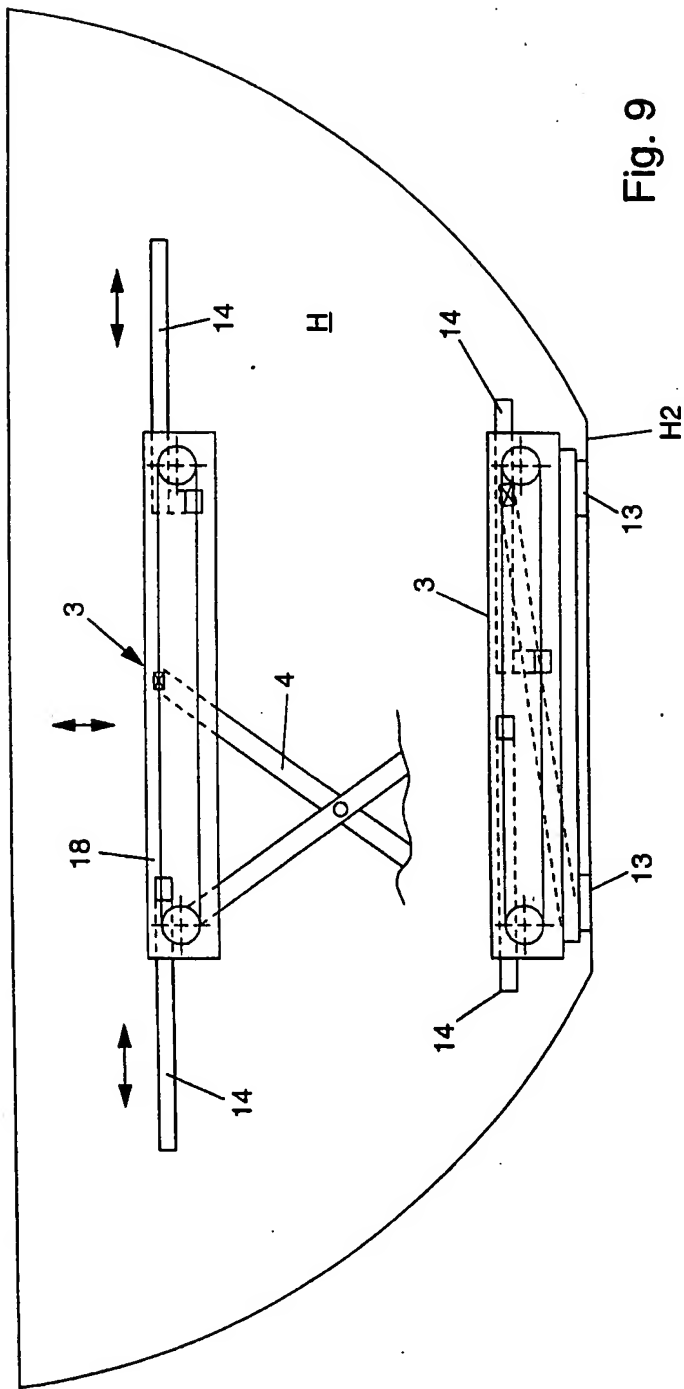


Fig. 9

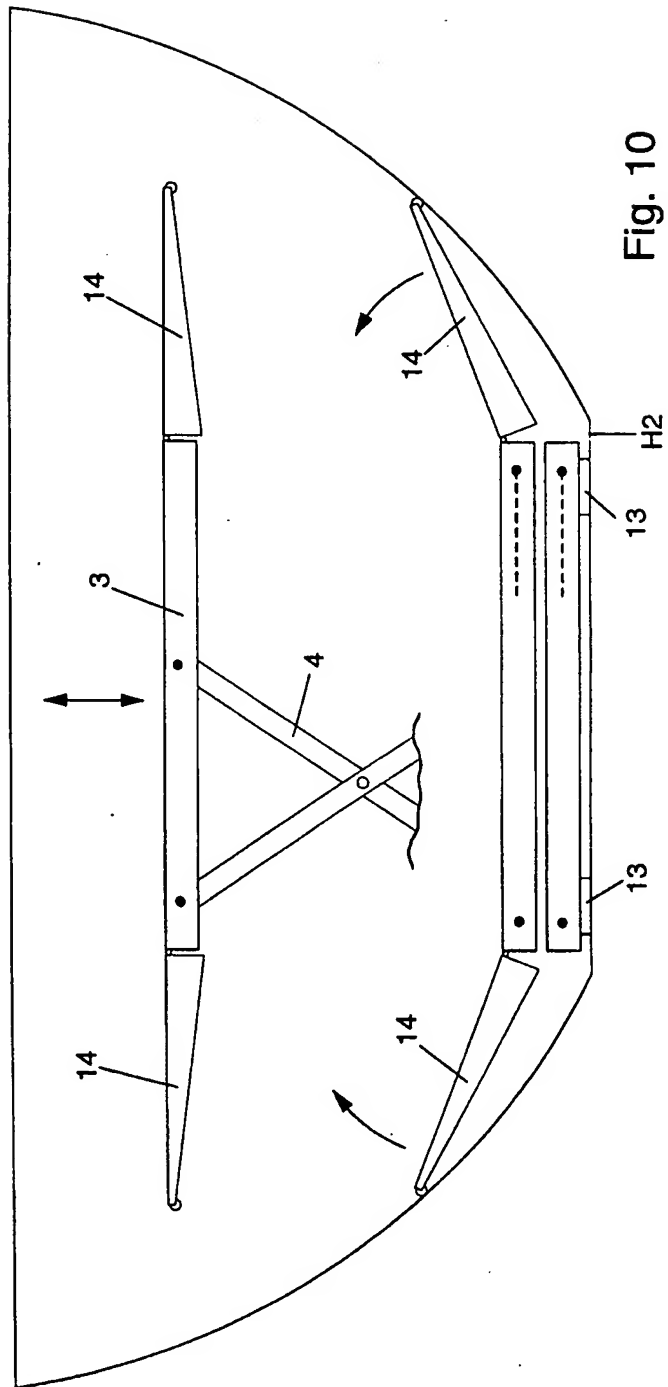


Fig. 10

# INTERNATIONAL SEARCH REPORT

Internatio. Application No

PCT/NL 98/00291

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65G7/08 B64F1/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65G B64F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 615 925 A (KAO CORP) 21 September 1994 cited in the application see page 8, line 24 - page 9, line 17; figures 4A,B,C see page 10, line 11 - line 23; figures 8A,B,C	1-3
A	US 5 325 953 A (DOSTER JOHN ET AL) 5 July 1994 cited in the application see column 3, line 57 - line 64; figure 2 see column 4, line 23 - line 36 see column 4, line 66 - column 5, line 11	1-4
A	US 4 281 955 A (MCWILLIAMS JOSEPH E) 4 August 1981 see figure 2	5

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- "A" document defining the general state of the art which is not considered to be of particular relevance
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17 August 1998

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/NL 98/00291

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 93 08078 A (LILJEVIK) 29 April 1993  see the whole document</p> <p>-----</p>	1



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/NL 98/00291

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